



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification 4 :  <b>G08B 13/06, 13/12, 13/24</b>  <b>G09F 3/03</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 87/ 04282</b></p> <p>(43) International Publication Date: <b>16 July 1987 (16.07.87)</b></p>
<p>(21) International Application Number: <b>PCT/AU86/00384</b></p> <p>(22) International Filing Date: <b>17 December 1986 (17.12.86)</b></p> <p>(31) Priority Application Number: <b>PH 4077</b></p> <p>(32) Priority Date: <b>3 January 1986 (03.01.86)</b></p> <p>(33) Priority Country: <b>AU</b></p> <p>(71) Applicant (for all designated States except US): <b>ADVANCED SYSTEMS RESEARCH PTY. LTD. [AU/AU]; 31 Bridge Street, Pymble, NSW 2073 (AU).</b></p> <p>(72) Inventors; and  (75) Inventors/Applicants (for US only) : <b>YERBURY, Michael, John [AU/AU]; 61 Richmond Avenue, St. Ives, NSW 2075 (AU). HURST, Gregory, Charles [AU/AU]; 14/2 Mary Street, Glebe, NSW 2037 (AU).</b></p> <p>(74) Agent: <b>F.B. RICE &amp; CO.; P.O. Box 117, Balmain, NSW 2041 (AU).</b></p>		<p>(81) Designated States: <b>AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.</b></p> <p><b>Published</b>  <i>With international search report.</i></p>
<p>(54) Title: <b>INVENTORY CONTROL SYSTEM</b></p>		
<p>(57) Abstract</p> <p>Inventory control tags comprise a detachment detector (11) associated with means for attaching the tag to an article such that detachment of the tag causes an alarm signal to be transmitted by a transmitter (14, 15, 16). The alarm signal is encoded by a code generator (12) to provide a uniquely coded signal which will identify the tag from which it is produced. Tags also include a receiver (1, 2, 3) for receiving interrogation signals in response to which the tag transmits its coded identifying signal. The tags are also switchable into and out of a deactivated state when specially coded disable/enable signals are received. These disable/enable signals cause a transmit enable memory (10) to toggle in state to enable and disable operation of the code generator (12) and transmitter (14, 15, 16) circuits.</p>		

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## INVENTORY CONTROL SYSTEM

The present invention relates generally to an improvement to an inventory control system for use in locations such as retail outlets, warehouses and so on.

5 In particular the invention provides a system which, in its preferred embodiment, can be used to identify individual objects, to allow an inventory of such objects to be maintained and to implement a multi-function security mechanism which reduces the risk of loss or theft  
10 of tagged objects.

The description of the present invention, and the system with which it is associated, will be given in terms of an intended application in retail stores and warehouses, but it will be recognised by persons skilled  
15 in the art that the possible applications of the invention extend beyond these specific examples.

The advantages of providing security tags on items in retail stores are well known. The principal advantage is that an alarm is set off when an item, from which the tag  
20 has not been removed at the point of sale, is carried out of the exit of the store. In some existing systems a supplementary benefit exists in that the coded tag may be used to maintain an inventory of stock. These conventional security tags signal an alarm only when an  
25 intact tag is carried through the exit of the store but not when the tag is removed by the thief or otherwise detached inside the store and some distance from the exit. In accordance with the present invention, tags are provided which cause an alarm to be set off in both  
30 situations i.e. when a tag is detached or tampered with inside the store (other than in the approved way at the point of sale) as well as when an intact tag is carried through the exit. In a preferred embodiment, the tag is uniquely encoded such that information about the item  
35 (e.g. type of item, colour, shape, model) from which a tag

- 2 -

was detached, as well as its approximate location, can be immediately made available to security personnel in the store when an alarm condition is triggered.

5 The advantages of recording items of stock with the aid of some form of "reading" instrument are also well known. Bar-code tags, for example, can be combined with optical readers to speed the recording of items of stock and to minimise the errors which occur when manual recording and subsequent transcription are used.

10 These conventional inventory systems, as typified by bar-code and similar short-range systems, provide no security functions.

In preferred embodiments of the present invention the unique code assigned to each tag is used to identify goods  
15 for the purposes of stock taking.

The present invention consists in a security tag comprising attachment means, alarm sensor means associated with the attachment means to signal when the attachment means are disconnected from an article to which the tag  
20 was attached and transmitter means to generate a radiated signal in response to the alarm means signalling the disconnection of the attachment means from said goods.

In preferred embodiments of the invention the tags are provided with encoding means enabling identification  
25 of a tag which is transmitting an alarm signal. Tags are also preferably provided with enabling and disabling means which are operated in the preferred embodiment by digitally encoded signals transmitted by an enabling transmitter.

30 The tags of the preferred embodiment will also include a receiver adapted to respond to a short range transmitted signal to cause the tag to transmit its identifying signal.

According to another aspect of the invention, an  
35 inventory control system is provided, in which the tags of

the present invention are used.

Preferred embodiments of the tag and the inventory control system will now be described, by way of example, with reference to the accompanying drawings in which:-

5        Fig. 1 schematically illustrates an embodiment of a tag according to the invention; and

      Fig. 2 schematically illustrates an interrogator and control system of an inventory control system which makes use of the tag of Fig. 1.

10        In an inventory control system which uses tags according to the present invention, there are three basic components: the tags to be attached to the objects which are being controlled, one or more interrogators, and a computer-based control system which operates the  
15        interrogators, maintains the inventory records and indicates in any required fashion the signalling of an alarm when this becomes necessary.

      The preferred features of the tags to be attached to the objects are that the tags should be small (so that  
20        they can be inconspicuously and harmlessly attached), they should be economically priced, they should have an operating life of several years (at least equal to the maximum expected residence time of any one item of stock in a given location), they should be capable of receiving  
25        control signals from interrogators at control points or points of sale and they should be capable of transmitting radio frequency signals over ranges of several tens of metres.

      The tags preferably are capable of implementing the  
30        following functions:

- i)        Storing coded identification (ID) information which may be associated, via software in the control system, with the object to be tagged.
- ii)       Repeatedly transmitting by radio the previously-  
35        stored ID code and an alarm signal, when the

method of attachment of the tag to the object is interfered with.

- iii) Repeatedly transmitting by radio the previously-stored ID code and an alarm signal when the tag passes through the field of an interrogator at a control point.
- iv) Transmitting by radio the previously-stored ID code in response to an interrogating signal at the point of sale for the purpose of stock control.
- v) Enabling or disabling the functions in (ii), (iii) and (iv) above in response to an appropriate interrogating signal at the point of sale.

The interrogators preferably will be capable of transmitting radio signals to the tags, receiving a number of radio frequency signals and interacting with the control system to perform the variety of required functions.

The functions of the interrogator will vary depending on whether it is being used to monitor an area for tag detachment alarm signals, to identify each item at an inventory check point or point of sale for the purpose of inventory control, or to carry out a security check at a control point.

In the preferred system, all interrogators are able to receive and decode identification and alarm signals and pass these codes to the control system. In addition interrogators used to perform security check or inventory control functions are able to transmit the appropriate signals to activate the responses in the tags.

In the preferred embodiment of the inventory control system, the control system will:

- i) maintain the list of all items in the inventory and their associated coded tags,
- ii) control the functions of the interrogators,
- iii) receive identification and alarm information passed

from the tags, and

- iv) activate any desired form of alarm response when the corresponding signal is transmitted by a tag and processed by an interrogator.

5       The method of operation of the preferred system will now be described as it relates to (a) inventory control, and (b) security control in a retail store or warehouse.

(a) Inventory Control

- i) At the inventory entry point (e.g. in the stockroom)  
10       a coded tag is applied to each item to be controlled by means of an attachment whose integrity can be monitored by the tag itself.

An interrogator in the stockroom is then used to enable the alarm functions of the tag and read its ID  
15       code. By means of a keyboard connected to the control system information relating to the tagged item is entered and associated in the control system database with the tag.

- ii) At the point of sale an interrogator transmits a  
20       short range coded signal to trigger the identification function of the tag.  
When brought within the field of the interrogator the tag replies with its previously-stored ID code. The interrogator then passes this sales information to  
25       the control system.

- iii) The interrogator then transmits a coded signal to  
30       disable the security alarm functions and thus enables the tag to be removed from the item without setting off the alarm. In addition the disabled tag may be taken through a security control point (if necessary) without triggering the corresponding alarm function.

- iv) At the point of sale following a "no sale" the  
interrogator may transmit a coded signal to re-enable the alarm functions of the tag.

35   b) Security Control

The following description is based on the presence of two interrogators operated by a control system. This number is chosen so as to illustrate the various features of the invention, but it will be obvious to persons skilled in the art that the functions could be combined into a single interrogator or that the number of interrogators could be increased. The description assumes that interrogator A is located at some convenient point in the warehouse or retail store, and that interrogator B is at an exit or security control point.

i) In normal circumstances interrogator A is in receiving mode and the tags attached to the objects secured are in their quiescent state. If the method of attachment of the object to the tag is tampered with (e.g. by breaking the attachment means), the tag repeatedly transmits the previously-stored code and alarm signal to interrogator A. This information is received by interrogator A, decoded and sent to the control system where an alarm function is implemented. Since software in the control system can associate this code with a particular item of stock, the store security staff immediately know the nature of the item from which the tag is being removed. Moreover, the fact that the alarm signal was received most strongly on one particular interrogator (A in this particular illustration) provides a general indication of the location of the potential theft. By using a plurality of such interrogators, the locality can be more clearly defined.

Although the above description is presented in terms of theft control it is obvious that the system operation implements a more general function of system security by monitoring the integrity of tag attachment.



- ii) Interrogator B is placed near the control point and has an antenna structure such that it has a narrow field of view. Interrogator B repeatedly sends the signal which will activate the second alarm function of the tag. When it is in the field of the interrogator and detects the signal the tag repeatedly sends its previously-stored ID code and alarm signal, and the control system decodes this information and activates any desired security action such as ringing bells, visual display on a terminal near the control point, etc. As in (i) above, security staff know not only that an item is being removed but are also provided immediately with a full description of that item.
- The security control function described above may be enabled or disabled at the stockroom or point of sale as described in (a) above.

As can be seen from the above discussion, the preferred embodiment of the inventory control system comprises several components: these being a central computer to control the operation of the system, several interrogator units, and individual identification tags to be attached to individual items of stock. Whilst having broadly the same operational characteristics, the interrogators may be divided into two types depending upon their specialised application as point-of-sale interrogators or control-point interrogators. The differences between these types will be discussed later.

The preferred embodiment of the tag is illustrated schematically in Figure 1. A coded electromagnetic signal from the interrogator is picked up on the input antenna 1 which is connected to tuned circuit 2. The signal may be situated anywhere in the radio frequency spectrum from LF to UHF but might typically be in the VHF band. The information is coded in the form of amplitude modulation

of the carrier signal. Four different commands are required to be detected and these may be coded in many possible ways but, by way of example, are encoded in the preferred embodiment using an error correcting digital code such as a BCH 7/4 code. Many other possibilities will be obvious to those skilled in the art. A detector circuit 3 with very low quiescent power consumption detects the presence of a signal at the tuned circuit 2 and causes the signal processing components of the tag to be connected to the battery 4 by the power control switch 5. The demodulator 6 in conjunction with the clock recovery circuit 7 extracts the data from the input signal and stores it in the data register 8. The function controller 9 causes the appropriate tag response to be performed dependent upon the information in the data register 8 and the state of the transmit enable memory 10. Table 1 lists the various inputs and the responses of the tag to these inputs as implemented by the function controller. In the case where the transmit enable memory is set to "disabled", the only response will be to an interrogator command to set the memory to "enabled". In the case where the memory is set to "enabled" and an input is received to cause the tag to transmit, the function controller 9 activates the code generator 12 to generate a digital code stream corresponding to the code stored in the ID code storage memory 13 plus further bits to indicate the nature of the response; i.e. point-of-sale identification, control-point alarm or detachment alarm. In the preferred embodiment the code generator generates a binary sequence with error correcting capability such as a BCH 31/21. This code would give a capability of providing  $2^{19}$ , or approximately half a million, unique tags. The ID code storage 13 may be implemented in many ways obvious to those skilled in the art but, for example, could be stored in a programmable read only memory programmed at

the time of assembly of the tag.

The output of the code generator 12 is passed to the modulator 14 where it modulates a radio frequency (RF) signal generated in the RF source 15. The resulting  
5 signal is radiated from the output antenna 16. The frequency of the RF signal is preferably in the VHF/UHF region for reasons of antenna efficiency but is not limited thereto. The frequency may be controlled in many ways obvious to those skilled in the art, for example, by  
10 transmission from the interrogator of a reference for synchronisation, by a crystal or by a surface acoustic wave resonator.

In addition to inputs received from an interrogator, the tag responds to the breaking of its attachment to an  
15 object. This is detected by the detachment sensor 11 which activates the function controller 9 if the transmit enable is set to "enabled". The detachment detector may be implemented in many ways but two means will be indicated by way of example. Referring to Fig. 3, a  
20 preferred embodiment of the tag 20 is attached to an item to be monitored by means of an insulated wire 21 of finite resistance. A very low power comparator incorporated into the detachment detector 11, then monitors the resistance of the wire to detect the occurrence of either an open  
25 circuit or a short circuit. In this way the breaking of the wire is readily detected and in addition any attempt to bypass the wire prior to breaking it in the hope of circumventing the alarm may also be detected by the tag. One end of the wire 21 is connected to the detachment  
30 detector 11 by a releasable electrical connection means 22 to enable easy removal of the tag from the article when sold.

Referring to Fig. 4 the tag 20 of a second embodiment contains one or more Wiegand wires 25 (refer to Australian  
35 Patent Specification No. 479,034) enclosed in a sense coil

- 10 -

23 which is connected to a very low power pulse detector 11. In this case the tag is attached to the item to be monitored by one or more pins 28 through the item, or other attachment means such as adhesive, and a magnet 26 is attached to the item adjacent to the tag but on the other side of the item so that the Wiegand wire 25 is in the field of the magnet 26. In the illustrated embodiment the magnet 26 is carried on a member 27 which also carries the pins 28 and the pins are received in co-operating 10 reciprocals 29 in the tag. In this configuration, separation of the tag from the magnetic backing will cause a pulse to be induced in the sense coil 23 by the Wiegand wire 25. This pulse is detected in the pulse detector 11.

15 In the case where more than one Wiegand wire is employed the magnetic thresholds of the wires may be chosen such that an increasing magnetic field strength as well as a decreasing magnetic field strength may be detected.

20 In this way the possibility of circumventing the detachment alarm by bringing another magnet close to the tag prior to detachment is reduced.

In all embodiments of the detachment detector, the detector circuitry is only powered up when the transmit 25 enable memory is set to "enabled".

In the preferred embodiment of the tag the power for operation of the tag is supplied by a battery 4 such as a lithium cell. Since the quiescent current drain of the tag may be kept to a level of only a micro-ampere or two a 30 cell with a capacity of 50 to 100 milliampere-hour will have a lifetime of several years. Battery lifetime is maximised by having only necessary circuitry powered up at any time. This is accomplished by the power control module 5 which takes input from the signal detector 3 and 35 the detachment detector 11 and powers the remainder of the

- 11 -

tag only when appropriate. Only the signal detector 3 and the transmit enable memory 10 are powered at all times.

In the preferred embodiment of the tag almost the entire circuitry is implemented in a single

5 custom-integrated circuit. This makes it possible for the tag to be packaged in a form small enough to have wide application.

The preferred embodiment of the interrogator system is depicted in figure 2. A central computer 40 controls a  
10 plurality of interrogators 41, 42, 43, 44 distributed throughout the premises which are being monitored for inventory control. These interrogators are essentially identical in operation in that they consist of a  
15 controller/code-generator to generate the appropriate code for transmission, an RF source and a modulation means 46 attached to a transmitting antenna 45. Also they have one or more receivers 47 which receive signals through individual receiving antennas 48, decode the transmission from the tags 20 and pass the relevant data to the central  
20 computer. The receivers on all interrogators are at all times "listening" for an alarm signal from any active tag 20. The differences between the interrogators relate to the different ways in which they are used:

i) The point-of-sale (POS) interrogators 41 and 42

25 are equipped with a transmitting antenna 45a which, in conjunction with a low output power level, confines its interrogation range to a localised region at the POS desk. In normal operation it transmits continuously the point-of-sale identification or IDENTIFY code. When an  
30 item for sale is brought near to the antenna the tag 20 responds to the transmitted code by transmitting its ID code. Upon receipt of the ID code via antenna 48a and receiver 47a, the interrogator sends the DISABLE code and then resumes transmission of the IDENTIFY command. If the  
35 tag 20 continues to respond to the IDENTIFY command after

the DISABLE code has been sent by the interrogator, the process is repeated until the DISABLE command takes effect or a failure is registered. When the DISABLE command becomes effective and the tag no longer replies to the

5 IDENTIFY command the ID information is sent to the central computer which notes that the item is about to be sold. The price details are registered on the cash register. A "beeper" indicates to the cashier that all details about the item have been recorded in the central computer and

10 that the tag 20 may be removed safely. If a sale is not completed before the tag is removed, the cashier can ENABLE the tag again and cancel the information at the central computer (or simply record a NO SALE with the information) before restoring the item with its tag to the

15 shop floor.

In order to prevent the tag transmissions in response to the IDENTIFY code from masking detection of an alarm signal, all POS interrogators are synchronised by the control computer such that they trigger the ID code

20 transmissions simultaneously at all points of sale and at roughly half second intervals. Thus there are regular "quiet" periods during which alarm signals can be received reliably.

After a tag has been DISABLED at the POS it may be

25 removed from the item and collected at any convenient point prior to re-use without triggering any alarms.

In the stockroom a version of the POS interrogator is used to ENABLE each tag and identify it after attachment to a new item of stock. At this time the ID number is

30 associated in the central computer with a detailed description of the item.

ii) A control-point interrogator

is positioned at all access points through which it is desired to detect the carriage of active tags 20. The

35 antenna 45b is thus positioned to localise the transmitted

signal to the region and the control-point signal is transmitted continually. In the event of an active tag 20 entering the region, the tag will respond by transmitting its ID code plus a control-point alarm signal, 5 continually. Some receivers 47 in the vicinity will detect the alarm but from the relative strength of the received signal at the receivers in question and the recognition of the alarm as a control-point alarm, the precise location of the potential theft can be determined 10 by the computer. In addition the tag ID is passed to the computer by the interrogators and thus a description of the stolen item is immediately available.

Interrogators installed in a store or warehouse are equipped with sufficient receivers 47 and their associated 15 receiving antennas 48 to adequately cover the entire area to be controlled. In the event of an active tag 20 becoming detached from its item and thus transmitting its ID and detachment alarm signal, one or more receivers 47 at one or more interrogators 41, 42, 43, 44 will receive 20 and demodulate the signal and pass the decoded information to the central computer 40. The central computer will be able to signal to security staff via an appropriate terminal 50 the nature of the alarm and a precise description of the item in question. From the known 25 location of the receivers that received the signal the computer may also indicate the approximate location of the tag.

The central computer 40 maintains the inventory of tags 20 in use, controls the functions of the 30 interrogators 41, 42, 43, 44 and interprets all alarm information for implementation of security functions.

TABLE 1

Input Stimulus		Transmit enable Memory state	Tag response
5	IDENTIFY signal	enabled	transmit identification
	IDENTIFY signal	disabled	no action
	Control-point signal	enabled	transmit ID code with control-point alarm bit set
10	Control-point signal	disabled	no action
	Tag ENABLE signal	enabled	no action
	Tag ENABLE signal	disabled	set transmit enable memory to "enabled"
15	Tag DISABLE signal	enabled	set transmit enable memory to "disabled"
	Tag DISABLE signal	disabled	no action
	Tag detachment	enabled	transmit ID code with detachment alarm bit set
20			
	Tag detachment	disabled	no action



## CLAIMS:

1. A security tag comprising attachment means, alarm sensor means associated with the attachment means to signal when the attachment means is being disconnected from an article to which it was previously attached and transmitter means to generate a radiated signal in response to the alarm means signalling the disconnection of the attachment means from said article.
2. The security tag as claimed in claim 1 wherein the attachment means comprises a conductive loop passing through the article to which it is attached, each end of the loop being electrically connected to respective inputs of an electrical circuit designed to detect changes in the resistance of the loop and to signal an alarm condition in the event of the loop resistance varying outside of predetermined tolerances.
3. The security tag as claimed in claim 1 wherein the alarm means comprises Wiegand wire and a magnet arranged such that their relative positioning must change in order to allow disconnection of the attachment means from the article, and the Wiegand wires being positioned in an electrical circuit to detect a magnetic pulse generated in the Wiegand wire when it is moved in the field of the magnet.
4. The tag as claimed in any one of the preceding claims wherein the tag includes encoding means to encode the radiated signal transmitted by the transmitter means, to enable identification of the tag and hence the article to which it is attached.
5. The tag as claimed in any one of the preceding claims wherein the tag includes receiver means adapted to receive a predetermined radiated signal and to cause the transmitter means to generate its radiated signal in response to the received signal.
6. The tag as claimed in any one of the preceding

claims, wherein means are provided for disabling the tag when not in use and re-enabling the tag when required.

7. The tag as claimed in claim 6 wherein the disabling and enabling means comprise a receiver adapted to receive a radiated encoded signal and enabling means incorporating a memory element, the enabling means being responsive to the encoded signal to respectively set and clear the memory element and the operation of the tag being dictated by the state of the memory element.

8. An inventory control system comprising at least one receiver means and a plurality of tags as claimed in any one of the preceding claims, the receiver means being responsive to the radiated signal which can be generated by each of the tags to cause an alarm to be triggered.

9. An inventory control system as claimed in claim 8 wherein the receiver is adapted to decode the signal received from the tags to enable identification of the tags.

10. An inventory control system as claimed in claim 9 wherein the tags include radio controlled enabling and disabling means and a transmitter is provided to selectively transmit enabling and disabling signals to respectively enable or disable individual tags.

11. The inventory control system as claimed in any one of claims 8 to 11 wherein at least one transmitter is provided adjacent to a control point in premises monitored by the system, the tags, when in close proximity to the transmitter, being responsive to a signal transmitted by the transmitter to generate their respective radiated signals which are in turn received by the receiver of the inventory control system, said receiver being located in close proximity to the transmitter.

12. A tag for an inventory control system, substantially as hereinbefore described with reference to the accompanying drawings.

13. An inventory control system substantially as hereinbefore described with reference to the accompanying drawings.

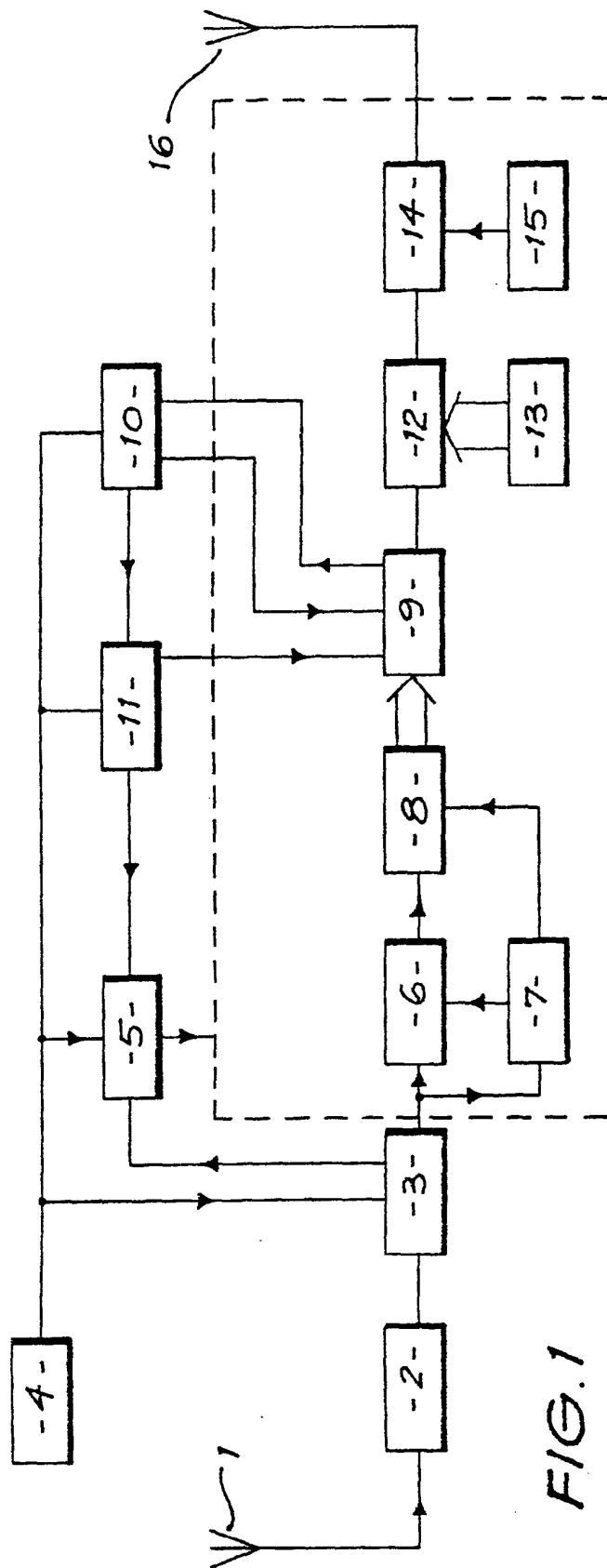


FIG. 1

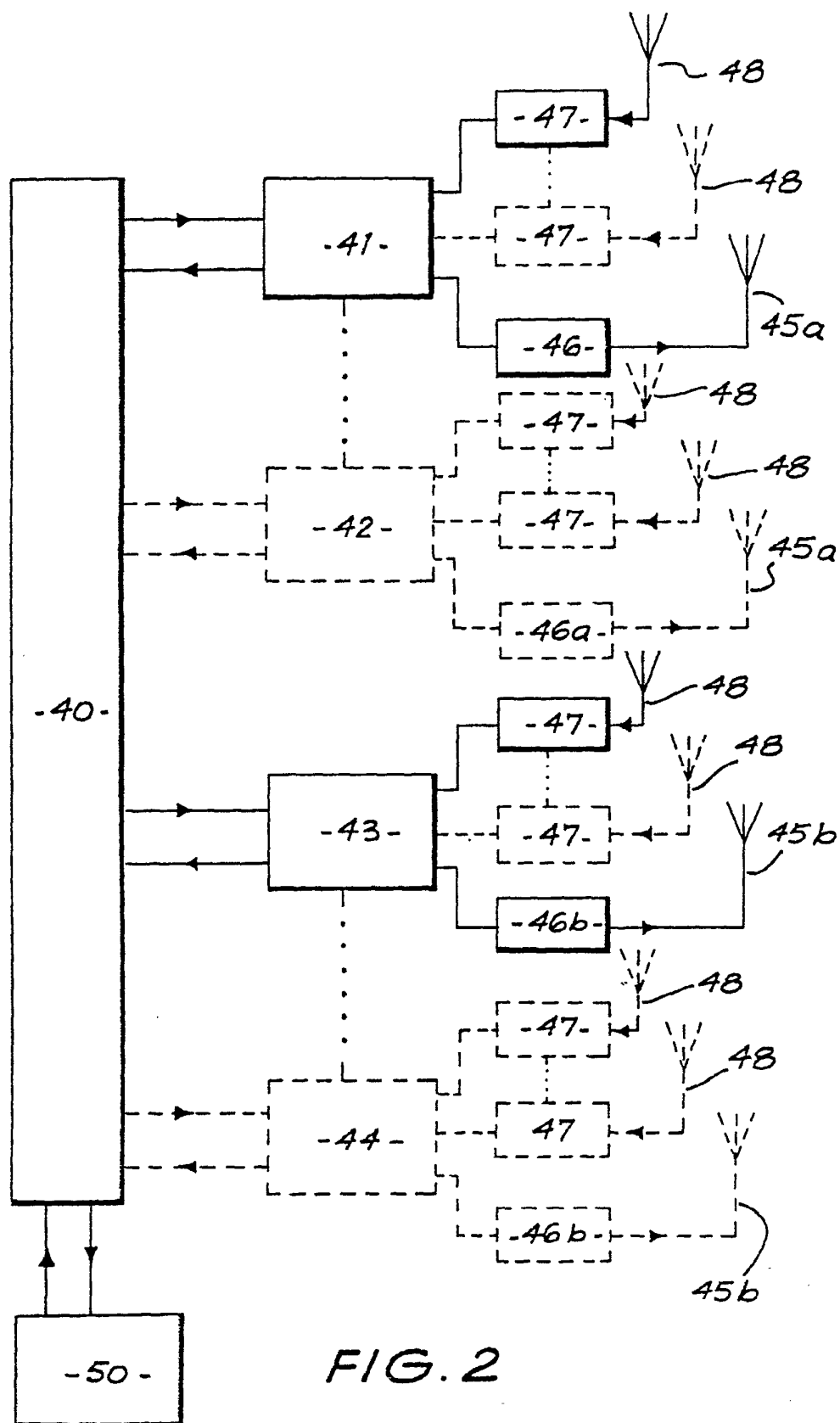


FIG. 2

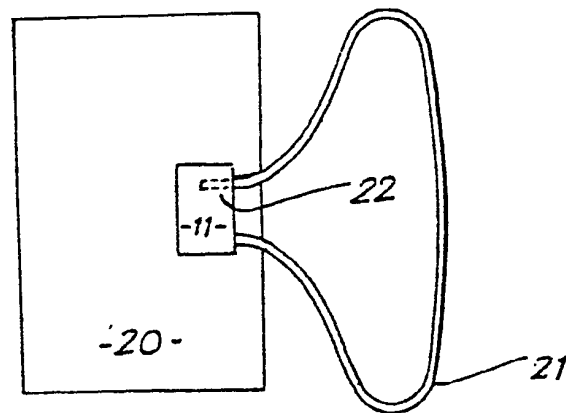
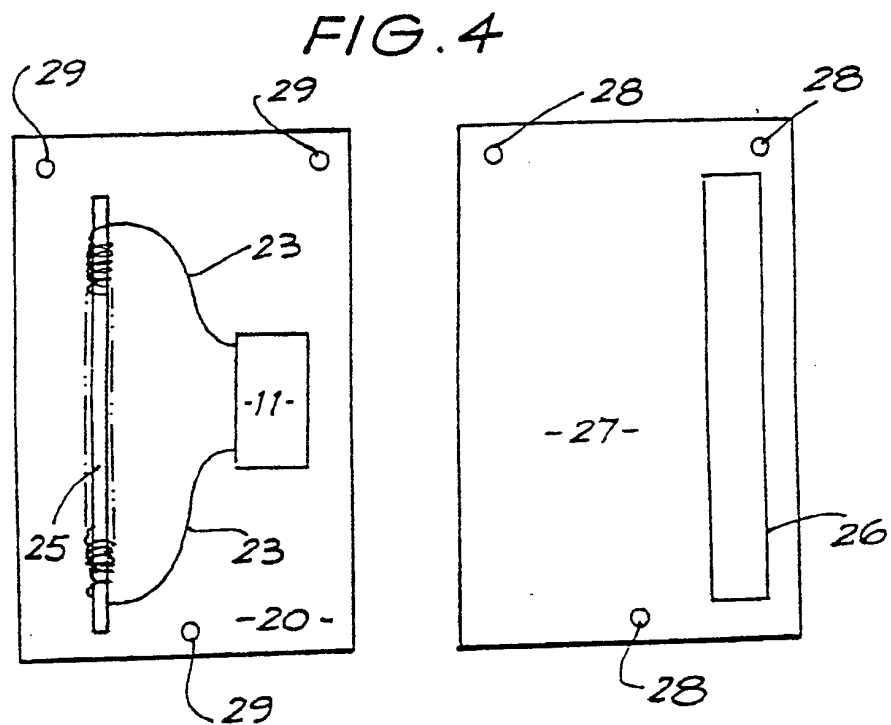


FIG. 3



# INTERNATIONAL SEARCH REPORT

International Application No PCT/AU86/00384

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. <sup>4</sup> G08B 13/06, 13/12, 13/24, G09F 3/03																																			
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched <sup>7</sup></div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; border-bottom: 1px solid black;">Classification System</td> <td style="border-bottom: 1px solid black;">Classification Symbols</td> </tr> <tr> <td>IPC</td> <td>G08B 13/06, 13/12, 13/24, G09F 3/03</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched <sup>8</sup></div> <p>AU:            IPC as above.</p>			Classification System	Classification Symbols	IPC	G08B 13/06, 13/12, 13/24, G09F 3/03																													
Classification System	Classification Symbols																																		
IPC	G08B 13/06, 13/12, 13/24, G09F 3/03																																		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category <sup>9</sup></th> <th style="width: 70%; border-bottom: 1px solid black;">Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup></th> <th style="width: 20%; border-bottom: 1px solid black;">Relevant to Claim No. <sup>13</sup></th> </tr> <tr> <td style="text-align: center;">X</td> <td>US, A, 4060040 (JOHNSSEN) 29 November 1977 (29.11.77)</td> <td style="text-align: center;">1, 6, 8</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US, A, 3713133 (NATHANS) 23 January 1973 (23.01.73)</td> <td style="text-align: center;">1,2, 5, 8, 11</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US, A, 3665448 (McGLINCHEY) 23 May 1972 (23.05.72)</td> <td style="text-align: center;">1, 2, 6, 8</td> </tr> <tr> <td style="text-align: center;">X</td> <td>NL, A, 8304413 (N.V. NEDERLANDSCHE APPARATEN-FABRIEK 'NEDAP) 16 July 1985 (16.07.85) DERWENT ENGLISH LANGUAGE ABSTRACT W05 85201541/33</td> <td style="text-align: center;">1, 2, 8</td> </tr> <tr> <td style="text-align: center;">A</td> <td>US, A, 3859652 (HALL) 7 January 1975 (07.01.75)</td> <td></td> </tr> <tr> <td style="text-align: center;">A</td> <td>US, A, 3774205 (SMITH et al) 20 November 1973 (20.11.73) Note remote coding at column 3, lines 18-24.</td> <td></td> </tr> <tr> <td style="text-align: center;">A</td> <td>AU, A, 37127/84 (REVLON INC) 4 July 1985 (04.07.85)</td> <td></td> </tr> <tr> <td style="text-align: center;">A</td> <td>US, A, 3521280 (JANCO et al) 27 July 1970 (27.07.70)</td> <td></td> </tr> <tr> <td style="text-align: center;">A</td> <td>US, A, 3500373 (MINASY) 10 March 1970 (10.03.70)</td> <td></td> </tr> <tr> <td style="text-align: center;">A</td> <td>US, A, 3493955 (MINASY) 3 February 1970 (03.02.70)</td> <td></td> </tr> </table>			Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	X	US, A, 4060040 (JOHNSSEN) 29 November 1977 (29.11.77)	1, 6, 8	X	US, A, 3713133 (NATHANS) 23 January 1973 (23.01.73)	1,2, 5, 8, 11	X	US, A, 3665448 (McGLINCHEY) 23 May 1972 (23.05.72)	1, 2, 6, 8	X	NL, A, 8304413 (N.V. NEDERLANDSCHE APPARATEN-FABRIEK 'NEDAP) 16 July 1985 (16.07.85) DERWENT ENGLISH LANGUAGE ABSTRACT W05 85201541/33	1, 2, 8	A	US, A, 3859652 (HALL) 7 January 1975 (07.01.75)		A	US, A, 3774205 (SMITH et al) 20 November 1973 (20.11.73) Note remote coding at column 3, lines 18-24.		A	AU, A, 37127/84 (REVLON INC) 4 July 1985 (04.07.85)		A	US, A, 3521280 (JANCO et al) 27 July 1970 (27.07.70)		A	US, A, 3500373 (MINASY) 10 March 1970 (10.03.70)		A	US, A, 3493955 (MINASY) 3 February 1970 (03.02.70)	
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>																																			
<b>IV. CERTIFICATION</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black;">Date of Mailing of this International Search Report</td> </tr> <tr> <td>25 February 1987 (25.02.87)</td> <td>(12.03.87) 12 MARCH 1987</td> </tr> <tr> <td style="border-bottom: 1px solid black;">International Searching Authority</td> <td style="border-bottom: 1px solid black;">Signature of Authorized Officer</td> </tr> <tr> <td>AUSTRALIAN PATENT OFFICE</td> <td>R. MURRAY </td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	25 February 1987 (25.02.87)	(12.03.87) 12 MARCH 1987	International Searching Authority	Signature of Authorized Officer	AUSTRALIAN PATENT OFFICE	R. MURRAY																									
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 86/00384

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members			
US	4060040	DE	2519799		
US	3774205	CA	972047	DE	2235309
		GB	1352818	JP	48025447
FR	2148042				
US	3500373	BE	698063	DE	1566716
GB	1181678				
AU	37127/84	DE	3447599	FR	2557714
		GB	2152335	JP	60215275
GB	8432726				
ZA	8409989				

END OF ANNEX